



HYDRO GEO CHEM, INC.

Groundwater Consultants

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Authorized by: SE

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MEMO TO: Robert Grote, Pueblo of Laguna
Pat Wise, Pueblo of Laguna
Frank Jones, Bureau of Indian Affairs
Marc Nelson, U. S. Geological Survey

FROM: Hydro Geo Chem, Inc.

SUBJECT: Progress of work on Laguna Reservation; December 1980.

Work on Phase 1 continued, along with some work on Phase 2, the numerical modeling. No field trips were made in December.

The size of the area being studied in detail is about 3600 square miles, consisting of the Laguna Reservation as the southeast corner of the area, extending northward about 60 miles to T. 22 N., and westward about 60 miles to R. 16 W. This includes most of the uranium mines and mills in the Grants mineral belt, excluding the Churchrock and Gallup areas, which are believed too distant to affect the Laguna area. The tentative base map size is 1:100,000, using the new U.S.G.S. metric series maps. On this scale, the study area is about 5 1/3 feet square. Chemical and water level data are being plotted on 1:500,000 scale maps for our use and for future presentations. Much of this data will later be plotted on 1:100,000 scale if the increased detail is necessary.

Geology: A preliminary report on the stratigraphy and structure of the study area was completed and sent to Clay Smith of the New Mexico Bureau of Mines and Mineral Resources for review. Work was begun on map drawing and arrangements were made with Bob Grote to visit the Reservation for a final geologic reconnaissance next month.

Hydrogeology: Potentiometric surface maps were made for the Morrison Formation for the mid-1950's, and the mid-1970's. Changes were only evident in the Crownpoint and the Ambrosia Lake areas. This is due both to dewatering and to the lack of historic data on water levels north of the Pueblo where Sohio, Bokum, U.N.C., and Kerr-McGee have all been dewatering to some extent.



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(Progress of work on Laguna Reservation: December 1980)

Potentiometric surface maps of the Gallup and Dakota Formations were drawn. The Mt. Taylor area can tentatively be identified as a recharge area for the Gallup. There is not sufficient detail to show the same for the Dakota, though the geochemistry suggests this.

The Rio San Jose, in the 10-12 mile reach between the lava flows and Casa Blanca, has tentatively been identified as a discharge area from the Morrison. Flow net analyses have shown that between 1-3 CFS is the discharge, which agrees well with Lyford's (Summary of the Groundwater Resources of the Pueblo of Laguna, 1977) measurements of about .1 CFS/mile gain in streamflow in this reach. A second discharge area, the Rio Puerco Fault Belt, between the Lucero Uplift and the Nacimiento Mountains, appears to have the same order of magnitude of discharge. A possible third area of discharge for the Westwater Canyon member is the Rio Paguete for about 2 miles below the railroad bridge just south of the Anaconda lease. This area will be investigated in the field next month. A final area of discharge may be from springs in Salado Canyon and in Cañon del Piojo, which will also be investigated next month.

The Jackpile Sandstone has tentatively been identified as hydrologically connected to the Dakota, and is recharged from above. Water-level data for this sandstone are available at the Jackpile and Sohio mines, but a potentiometric surface map cannot be drawn unless Bokum, Exxon, and Kerr-McGee data become available. This will be checked next month. Discharge areas for the Jackpile are the Jackpile mine, springs in the above mentioned canyons, and possibly downward leakage into the Westwater.

Geochemistry: Isopleth maps of specific conductance were drawn for the Gallup, upper Mesaverde, and Morrison Formations. There are insufficient data to contour the Dakota and Jackpile Sandstones. Specific conductance was used instead of T.D.S. because there are many more data points. The contours agree well with Lyford's (Groundwater in the San Juan Basin, New Mexico and Colorado, 1979) dissolved-solids concentration maps. Piper and Rose diagrams are being drawn to assist in determining vertical groundwater movement.

The possibilities of isotopic analyses of groundwater were discussed, but actual sampling must await further refinement of our knowledge of the groundwater flow system. The areas that this type of analyses would be of benefit are in the Jackpile sandstone and the Westwater Canyon member in the Anaconda lease area. Age determinations there could substantiate the long, arcuate flow path of Westwater Canyon water from the Zuni Uplift area, and possible mixing with water from below. A young age for Jackpile water would verify that the recharge area was close, i.e., the Mt. Taylor area. Older ages might imply mixing with older water.

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Numerical modeling: The source code for the 3-D version of the aquifer simulation model (Posson and others, 1980) was obtained from Peter Frenzel. The code will require minor changes in order to execute it on the University of Arizona Cyber 175, and these changes are in the process of being implemented.

In general, the work on Phase 1 is estimated to be about 1/3 complete. Two, and possible three more field trips are planned; in addition, a meeting between Hydro Geo Chem and the B.I.A. is planned as soon as the model boundaries are decided. This will probably be in late January.

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